REDEC'25 technical program

Beirut time	Wednesday, September 24	Thursday, September 25	Friday, September 26
8:30 - 9:00	Registration	Registration	
9:00 - 9:30			Social Event
9:30 - 10:30	Opening ceremony	KL-3: Keynote Lecture 3	
10:30 - 11:00	KL-1: Keynote Lecture 1	Coffee break	
11:00 - 11:30		TS-3: Renewable Energy Resources TS-4: Energy Management, Saving and Efficiency II	
11:30 - 12:00	Coffee break		
12:00 - 12:30	KL-2: Keynote Lecture 2 (French session)		
12:30 - 13:00		Lunch	
13:00 - 14:00	SS-1: Special Session 1 - Energy Efficiency, Energy Economics and Climate Action		
14:00 - 15:30	Lunch	SS-3: Special Session 3 - Advancing Energy Communities in Lebanon	
15:30 - 16:00	SS-2: Special Session 2 (French) - Renforcement des Capacités sur les SEACAPs		
16:00 - 16:30		Coffee break	
16:30 - 17:00		TS-5: Renewable Energy Storage TS-6: Socio-Economic, Policy Issues and Legislation Related to Renewable Energy	
17:00 - 17:30	Coffee break		
17:30 - 17:45	TS-1: Energy Management, Saving and Efficiency I TS-2: Renewable Energy Conversion		
17:45 - 18:00			
18:00 - 18:45			
18:45 - 19:30			
19:30 - 23:00		Gala Dinner	

Wednesday, September 24

8:30 - 9:30: Registration

Room: Conference Business Center

9:30 - 10:30: Opening ceremony

Room 1

10:30 - 11:30: Keynote Lecture 1

A Probabilistic, Physics-Based Framework for Robust Digital Twin Development

Lecturer: Prof. Charbel Farhat, Department of Aeronautics and Astronautics and Institute for Computational and Mathematical Engineering, Stanford University, USA

Room 1

Chair: TBD

Abstract: A digital twin is commonly defined as a dynamic, virtual replica of a physical asset, process, or system. Unlike earlier static models or disconnected simulations, it is continuously updated through real-time data streams – often originating from sensors and other monitoring sources – enabling the twin to evolve in tandem with its physical counterpart. This live integration supports advanced monitoring, analysis, prediction, and, most importantly, decision making and optimization throughout the lifecycle of the physical system. Constructing such technology typically requires combining artificial intelligence, machine learning, and software analytics with physics-based modeling, thereby creating adaptive simulation models that remain synchronized with reality. Early digital twins often focused on combining data analytics with model-based prediction of selected quantities of interest (QoIs). This lecture will critically examine whether a limited set of QoIs can always capture the true state of a newly designed and deployed platform. While the “Digital” side of digital twins is widely understood, the “Twin” presents greater challenges – chief among them the risk of misrepresenting the physical system. To mitigate this, we introduce a methodology based on adaptable, stochastic, computationally tractable, low-dimensional yet high-fidelity physics-based models rooted in partial differential equations. This framework incorporates strategies for quantifying model-form uncertainty through a multi-component probabilistic approach, alongside projection-based model reduction and machine learning, yielding stochastic physics-based models capable of self-adaptation through sensor data assimilation and real-time operation. The lecture will illustrate this approach through case studies, including aircraft vibration assessment, UAV autonomous landing, condition-based aircraft maintenance, and in-cockpit prediction of aerodynamic loads

11:30 - 12:00: Coffee break

Room: Conference Business Center

12:00 - 13:00: Keynote Lecture 2 (French session)

Intelligence énergétique et souveraineté durable : redessiner le futur énergétique des pays en développement pour accélérer leur productivité à l'ère 5.0

Lecturer : Dr. Hussein Ibrahim, Directeur du Centre National Intégré du Manufacturier Intelligent (CNIMI), Québec, Canada

Room 1

Chair: Mazen Ghandour (Lebanese University, Lebanon)

Résumé : À l'ère des bouleversements climatiques, géopolitiques et technologiques, les pays en développement sont confrontés à un double défi : sécuriser leur approvisionnement énergétique et accélérer leur industrialisation. Cette conférence d'ouverture propose une vision intégrée de l'intelligence énergétique, alliant technologies émergentes (IA, IoT, réseaux intelligents), production locale décentralisée (énergies renouvelables, stockage d'énergie), sobriété énergétique et autonomisation des systèmes. Elle explorera comment cette approche peut renforcer la sécurité énergétique, stimuler l'innovation industrielle et favoriser des modèles économiques inclusifs, durables et résilients. L'objectif : bâtir des écosystèmes productifs, résilients et décarbonés, capables de soutenir une industrialisation agile et durable. En articulant énergie, technologie et productivité, cette vision trace une voie concrète vers une économie plus autonome, compétitive et inclusive pour les pays du Sud à l'ère 5.0 où la technologie et l'humain sont appelés à conjuguer ensemble pour garantir un meilleur avenir pour ces pays.

13:00 - 14:00: Special Session 1 - Energy Efficiency, Energy Economics and Climate Action

Opportunities and Challenges for Developing Countries

Panelists:

- Eng. Wissam Chbat, Head of Geology & Geophysics Department at the Lebanese Petroleum Administration
- Eng. Ziad Haddad, President-Elect at the Association of Energy Engineers (AEE), USA, Senior Director of Physical Plant at the Lebanese American University (LAU)
- Dr. Mounir Rached, President of Lebanese Economic Association, Former Senior Staff of the International Monetary Fund

Room 1

Chair: Jihad El Hokayem (Rethinking Lebanon)

14:00 - 15:30: Lunch

Room: Campus restaurant

15:30 - 17:00: Special Session 2 (French) - Renforcement des Capacités sur les SEACAPs

Pratiques et Outils au Liban, en Méditerranée et à l'International

Panelists:

- Programme CLIMAMED : Appui aux SEACAPs en Méditerranée - Myriam Makdissi (CLIMAMED)
- Vue Régionale MENA : Dynamiques autour des SEACAPs - Georges Youssef (GCoM)
- MeetMED III : Harmonisation et renforcement des SEACAPs - Expert MEDENER
- Retour d'expérience libanais : Mise en oeuvre municipale d'un SEACAP - Nouha Ghousseiny
- Outil CLACC : Adaptation au changement climatique pour les collectivités locales - Julien Bou Gebrayel (ALMEE)

Room 1

Chair: Adel Mourtada (UL – ALMEE, Lebanon)

Cette session vise à renforcer les capacités des collectivités locales en matière de planification climat-énergie, à travers le partage d'outils opérationnels, de retours d'expérience sur les SEACAPs (Plans d'Accès à l'Énergie Durable et d'Action Climat), et la présentation d'initiatives régionales (GCoM, meetMED III, CLIMAMED) et locales (outil CLACC). Elle favorisera les synergies entre acteurs libanais, méditerranéens et internationaux engagés dans la transition énergétique territoriale.

17:00 - 17:30: Coffee break

Room: Conference Business Center

17:30 - 18:45: Energy Management, Saving and Efficiency I

Room 1

Chairs: Remi Ziad Daou (Saint Joseph University of Beirut, Lebanon), Talal Salem (Notre Dame University - Louaize, Lebanon)

Enhancing Power Flow and Energy Trading in Distribution Network Enabled with Blockchain

Mohamad Majed, Riad Chedid (American University of Beirut, Lebanon)

Assessment of Firm Capacity in Hybrid Systems: A Dubai Case Study on ESS Sizing

Ahmad El Sayed, Gokturk Poyrazoglu (Ozyegin University, Turkey)

Evaluating Optimal PCM Integration in Building Envelopes Across Lebanese Regions

Chawki Lahoud, Rawad Al Harake, Mira Fatfat, Jamal Harmouche (University of Balamand, Lebanon); Joseph Kesserwani, Sami Youssef (Saint Joseph University of Beirut, Lebanon)

Integrating Passive Energy Conservation Measures in Mediterranean Residential Buildings

Wael Saad Al Hadidi, Chawki Lahoud, Jean-Pierre Raffoul (University of Balamand, Lebanon); Joseph Kesserwani, Sami Youssef (Saint Joseph University of Beirut, Lebanon)

Premixed Flame Dynamics in Confined Channels: Toward Efficient Heat Generation

Remi Ziad Daou (Saint Joseph University of Beirut, Lebanon); Joel Daou (University of Manchester, United Kingdom)

17:30 - 18:45: Renewable Energy Conversion

Room 2

Chairs: Anissia Beainy (ALMEE – The Lebanese Association for Energy Saving & for Environment, Lebanon), Jean Sawma (Saint Joseph University of Beirut, Lebanon)

Feasibility Study of PV/T Green Hydrogen Energy System for a House in Lebanon

Amal M Asaad (American University of Beirut, Lebanon); Abdallah F Makke, Fatme M Ezzeddine, Khadija A Ramadan, Mohammad Ihab Kawtharani, Mariam M Itani (Phoenicia University, Lebanon)

Photovoltaic Integration in Cold Storage Warehouse: Performance and Economic Viability

Rawad Malaeb, Youssef Riachi, Rami Abi Zeid (Dar Al Handasah – Shair and Partners, Lebanon)

Cogeneration in buildings coupled with PV system: Case study and Technical feasibility

Jean Paul Succar, Elie Kabban, Charbel Seif (Dar Al Handasah – Shair and Partners, Lebanon)

PV-Battery Fed Open-End Winding Induction Motor for Pumping Applications

Khaled Abdul Nasser Safsouf, Jean Sawma, Hadi Y. Kanaan (Saint-Joseph University of Beirut, Lebanon)

A Comprehensive Review of PEM Electrolyzers and Fuel Cells in Hybrid Hydrogen Energy Systems

Bilal A Izzo, Gabriel Khoury, Jihane Rahbani El-Mounsef (Saint-Joseph University of Beirut, Lebanon)

Thursday, September 25

7:30 - 9:30: Registration

Room: Conference Business Center

9:30 - 10:30: KL-3: Keynote Lecture 3

Efficient design of power electronics converters to meet energy efficiency and sustainable development targets

Lecturer: Prof. Kamal Al-Haddad, Ecole de Technologie Supérieure (ETS), Montreal, Canada

Room 1

Chair: Hadi Y. Kanaan (Saint-Joseph University of Beirut, Lebanon)

Abstract: This presentation will focus on the challenges of producing electric energy from various sources to meet the ever increase in electron demand to power the AI data centers along with transportation and electrification of fast-growing loads. It is assumed that more than 80 % of the produced electric energy is to be processed by power electronic converters; therefore, an efficient design of power stages should consider environmental sustainability criteria to meet the target. Topics include reducing material usage through optimized topologies and the selection of environmentally responsible components. The goal is to inspire engineers to create converters that are not only efficient and high performing, but also responsible stewards of the planet's valuable and limited resources to ensure sustainability.

10:30 - 11:00: Coffee break

Room: Conference Business Center

11:00 - 12:30: Renewable Energy Resources

Room 1

Chairs: Tilda Akiki (University Holy Spirit Kaslik, Lebanon), Sami H Karaki (American University of Beirut, Lebanon)

Green Hydrogen DC Bridge from Africa to Europe

Amal M Asaad, Batool Harb, Sami H Karaki (American University of Beirut, Lebanon)

A Technical Study on Wave Energy in Lebanon

Jose Marie Saad, Chawki Lahoud (University of Balamand, Lebanon); Joseph Kesserwani, Sami Youssef (Saint Joseph University of Beirut, Lebanon)

Symbiotic Fossil Fuel/RDF Gas Turbine Power Plants For Lebanon - A Reexamination

Rida Nuwayhid, Michel J Owayjan, Abbas Toufaily, Maroun Attieh, Roger Achkar (American University of Science and Technology, Lebanon)

Network Expansion Planning with Renewable Resources and Storage

Mohammad Khalil Fattouh, Sami H Karaki (American University of Beirut, Lebanon)

Landfill Gas Valorization into Ethylene: A Simulation-Based Case Study from Lebanon

Nour Maassarani, Maya Achkar, Joya Joubran, Soha Khalife, Marina Al-Daccache, Melissa Said (Université Saint Joseph de Beirut, Lebanon)

Actual Power Curve Construction and Detection of Normal and Abnormal Data in Wind Turbine Operation:

Omar Ratib Khazaleh, Nidal Abdalla, Ali Alkuzaie (National Energy Research Centre, Royal Scientific Society, Jordan)

11:00 - 12:30: Energy Management, Saving and Efficiency II

Room 2

Chairs: Mohamed Hmadi (Consult, Lebanon), Rita Najjar (Lebanese University, Lebanon & ALMEE, Lebanon)

DC Energy Router Design for the Energy Internet

Amani Fawaz (Saint-Joseph University of Beirut, Lebanon); Imad Mougharbel, Kamal Al-Haddad (Ecole de technologie supérieure, Canada); Hadi Y. Kanaan (Saint-Joseph University of Beirut, Lebanon)

An Open Modular Architecture for Climate-Aligned Building Assessment: GRASSMed Green BOOCC Platform

Rita Najjar, Adel Mourtada (Lebanese University, Lebanon & ALMEE, Lebanon)

Grid Stability and Power Factor Dynamics in Solar Farms Integration

Hassan Osseily, Omar Srouji, Mohammad Jammal (Lebanese International University, Lebanon)

Nonlinear Power Flow Routing in MAB Converters

Ahmad Rammal, Jean Sawma, Hadi Y. Kanaan (Saint-Joseph University of Beirut, Lebanon)

Unlocking Energy Efficiency in Uzbekistan's Residential Sector: Renovation Pathways, Market Dynamics

Rita Najjar, Adel Mourtada (Lebanese University, Lebanon & ALMEE, Lebanon)

Real-Time Mobile Monitoring of an IoT-Based MPPT Solar Charger Using Arduino and WebSocket Protocol

Nizar Daou (ISAE - Cnam Liban, Lebanon); Jean Sawma, Flavia Khatounian (Université Saint Joseph de Beyrouth, Lebanon)

12:30 - 14:00: Lunch

Room: Campus restaurant

14:00 - 16:00: Special Session 3 - Advancing Energy Communities in Lebanon

Technical Pathways for Grid Integration, Synchronization & Smart Energy Systems

Room 1

Chair: Sabine Saad (ALMEE, Lebanon)

This session builds on the outcomes of the July 2025 TESSA Roundtable, which emphasized the potential of decentralized energy communities to address Lebanon's chronic power crises. Despite emerging pilot projects, technical challenges remain a major barrier-particularly in grid injection, synchronization of distributed energy resources (DERs), smart metering, and protection systems. This high-level technical roundtable will convene engineers, grid operators, energy regulators, municipalities, and donors to explore concrete, scalable solutions for energy community integration-while also supporting ongoing reforms to Lebanon's legal and regulatory frameworks (e.g. Law 318).

16:00 - 16:30: Coffee break

Room: Conference Business Center

16:30 - 17:45: Renewable Energy Storage

Room 1

Chairs: Nagham El Ghossein (Lebanese American University, Lebanon), Semaan Georges (Notre Dame University-Louaize, Lebanon)

Investigation of the optimal PCM wall location into buildings envelope under Mediterranean climate

Sayed Geitani, Christian Chedid, Jamal Harmouche, Chawki Lahoud (University of Balamand, Lebanon); Joseph Kesserwani, Sami Youssef (Saint Joseph University of Beirut, Lebanon)

Performance Evaluation of Wind-Powered Electrolysis Systems with Energy Storage for Green Hydrogen

Naveed Anwar (Effat University, Jeddah, Saudi Arabia); Mohammed Abdul Majid (Effat University, An Nazlah Al Yamaniyyah, Saudi Arabia); Muhammad Samee Baig (Effat University Jeddah, Saudi Arabia)

Review of Fast Charging Strategies in Lithium-Ion Battery Electric Vehicles

Hassan Iskandarani (Saint-Joseph University of Beirut, Lebanon); Nagham El Ghossein (Lebanese American University, Lebanon); Hadi Y. Kanaan (Saint-Joseph University of Beirut, Lebanon); Ali Sari (University Lyon 1, France)

Non-Invasive Diagnosis of Aged Lithium-Ion Capacitors using Distribution of Relaxation Times

Ali Sleiman, Nagham El Ghossein (Lebanese American University, Lebanon)

Techno-Economic Assessment of Green Hydrogen Integration into Residential Buildings

Lynn Hamdan, Chantal Maatouk (Saint Joseph University of Beirut, Lebanon)

16:30 - 17:45: Socio-Economic, Policy Issues and Legislation Related to Renewable Energy

Room 2

Chairs: Renalda El-Samra (University of Saint Joseph of Beirut, Lebanon), Adnan Jouni (UL-ALMEE, Lebanon)

Green Hydrogen for Lebanon: A Comprehensive Framework for Economic Transition, Energy Sovereignty

Anissia Beainy, Sabine Saad (ALMEE, Lebanon); Adel Mourtada (UL-ALMEE, Lebanon)

A Comparative Study of CO2 emissions in EV, HEV, FCEV and Bioethanol FCEVs

Clovis Francis, Majd Saied. Mohamad Almoghubat (Lebanese University, Lebanon)

Development of Five Sustainable Energy and Climate Action Plans in Azerbaijan

Sabine Saad (ALMEE, Lebanon); Adel Mourtada (UL-ALMEE, Lebanon)

Enabling Climate-Smart Wastewater Infrastructure in Developing Countries

Renalda El-Samra, Marina Al-Daccache (University of Saint Joseph of Beirut, Lebanon)

Guide for Lebanese Communities on Adaptation to Climate Change 2024

Julien Bou Gebrael (Lebanese Association for Energy Saving and for Environment, France); Nadine Yehya (Saint Joseph University, Lebanon); Sabine Saad, Anissia Beainy (ALMEE, Lebanon)

19:30 - 23:00: Gala Dinner

Location: Amar Seaside seafood restaurant - Antelias

Friday, September 26

9:00 - 18:00: Social Event
Touristic visits & lunch